J. Nelson

January 10, 1997

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Subject: Leroy Anderson Dam, No. 72-9—Santa Clara County

SUMMARY REPORT AND ANALYSIS OF SURVEILLANCE DATA

- Piezometer and Monthly Rainfall Data from January 1993 through December 1996
- Survey Monument Data from January 1993 through May 1996
- Spillway Underdrain Flow Data from May 1993 through December 1996

INTRODUCTION

This interim summary report provides an analysis of current surveillance data from Leroy Anderson Dam, No. 72-9. A complete report covering the entire history of surveillance at Leroy Anderson Dam is scheduled for future production. Figure 1 shows the locations of the surveillance points discussed below. Figure 2 shows both piezometers in cross section. Table 1 summarizes pertinent dam statistics, Table 2 summarizes 1993 to 1996 piezometer and monthly rainfall data, Table 3 summarizes 1993 to 1996 dam crest monument survey data, and Table 4 summarizes 1993 to 1996 spillway underdrain flow data.

The piezometers are read monthly and the crest monuments are resurveyed annually. Seepage at the spillway underdrain discharge point is measured seasonally as it occurs. Reported rainfall is measured at Santa Clara Valley Water District (District) Rain Gauge No. 41-2073, located a few hundred feet southeast of the right abutment of Leroy Anderson Dam.

SUMMARY OF FOUNDATION AND EMBANKMENT CONDITIONS

Information in this section is based on Wahler Associates' 1986 Inspection and Safety Review report of Leroy Anderson Dam, prepared in accordance with requirements of the Federal Energy Regulatory Commission.

Foundation earth materials beneath the dam are rocks of the Jurassic-Cretaceous Franciscan Complex. Specifically, the lower right abutment is underlain by dense sandstone and shale, while the upper right abutment and upstream right abutment are underlain by soft, sheared serpentine. The serpentine extends from the upstream toe in the channel and cuts diagonally downstream across the right abutment. The serpentine/sandstone contact is characterized by a zone of crushed and faulted serpentine. Numerous faults mapped within the serpentine appear to be traces of the Coyote Creek fault system.

The dam embankment consists of a wide, central impervious core designated as Zones 2 and 3, flanked by upstream and downstream rockfill shells designated as Zones 1 and 4. Seepage control through the dam is provided by the downstream rockfill. A 20- to 30-foot wide strip drain was constructed on the foundation beneath Zone 3 on the left side of the channel section. It appears this drain may have been constructed to control seepage from several springs that were apparently encountered during construction.

PIEZOMETER DATA

Figure 3 is a plot of reservoir water levels versus piezometric surface data, and monthly rainfall data, from January 1993 through December 1996. This surveillance period represents roughly four rainy seasons with generally normal to above normal rainfall. The beginning of 1993 rainy season marked the end of a relatively long drought that began in about 1987. Piezometric levels generally trended upward over this period, probably in response to generally greater storage over longer intervals than in the immediate past. There is some indication of a 5- to 6-month lag time between reservoir peaks and subsequent piezometric highs. The lag time between reservoir lows and the subsequent piezometric lows appears to be about 1 to 2 months.

Pneumatic piezometers PPA-1 and PPA-2 appear to have provided reliable data during the entire surveillance period.

The piezometric data indicate that the embankment and its foundation are performing satisfactorily with respect to seepage.

MONUMENT DATA

Due to extensive dam crest modifications in 1987 and 1988, the original 15 crest monuments were destroyed and 16 new dam crest monument locations (Monuments 16 through 31) were established. In addition, three new monument locations (Monuments 13, 14, and 15) were established on the right and left spillway training walls (Figure 1).

Figures 4, 5, and 6 are plots of new crest monument displacement versus time for the period of July 20, 1988, through May 22, 1996, in the Z (settlement), X, and Y directions, respectively. (Figure 1 shows locations of the X and Y axes.) The July 20, 1988, date represents the first monument survey of the new monuments after the 1988 dam raise. Approximate maximum displacements experienced by the new crest monuments were: 0.25 feet in the negative X direction (Monument 24); 0.11 feet in the negative Y direction (Monuments 18 and 20); and 0.35 feet in the negative Z direction (settlement) (Monument 24).

The monuments were surveyed on May 22, 1996, to evaluate the effects of a magnitude 4.9 earthquake that occurred on May 21, 1996. The epicenter was located approximately 14 miles northwest of Leroy Anderson Dam. A District employee inspected the dam after the earthquake and did not observe any indications of problems with the dam or appurtenant structures. See the following **Local Seismicity During 1993 Through 1996** section for additional discussions of local earthquakes.

Based on a year-to-year comparison, typical crest monument displacements due to consolidated settlement and lateral movement have been within reasonable limits for the period of record presented here. No unusual trends are evident in the crest monument data.

SPILLWAY UNDERDRAIN FLOW DATA

and monthly rainfall data

Figure 7 is a plot of reservoir level versus spillway underdrain flow from May 1, 1993, through December 12, 1996. Spillway underdrain flow has been measured when feasible by reading a water flowmeter installed on the central exit hole of the underdrain system. The discharge hole is located about 3 feet below the lip of the spillway terminus. During high reservoir stages, maximum reported seepage flows were 131 gallons per minute (gpm) on May 24, 1993, and June 29, 1995, and 158 gpm on May 16, 1996. The measured flow is only a rough indication of total flow because other exit points also discharge water. Based on visual observation, it seems likely that the measured flow is between 1/3 and 1/2 of the total flow discharging from all underdrain exit points. It is not possible to observe underdrain discharges when the reservoir is spilling. Further studies are planned to evaluate the underdrain flows.

To protect the meter from damage, it is removed when the reservoir approaches spill. To prevent vandalism, the meter is removed when flows are low or cease during the summer months. This explains gaps in the data shown on Figure 9.

A brief report by Wahler Associates dated May 25, 1993, concluded that spillway underdrain flows were well within the range of past drain or weep hole flows into the original spillway, and no safety-related concerns exist because the spillway slab is well drained with substantial anchorage into the underlying bedrock.

VISUAL OBSERVATIONS

Visual observations are made by District employees during site visits for routine surveillance, operational, or other activities. These observations resulted in the metering of a portion of the spillway underdrain flows and recording locations of additional very minor seepage locations (particularly at weep holes) in the spillway walls and floor during high reservoir levels. Heavy rains occasionally activate landslides along Dunne Avenue on the east side of the south arm of the reservoir. These are slow-moving rotational slumps that are located too far from the dam and inlet structure to have any adverse impacts on safety or operational considerations. Except for these observations, no conditions were noted that warranted special attention during the period 1993 through 1996. Engineers from the Division of Safety of Dams may have occasionally noted conditions that were treated as routine maintenance.

LOCAL SEISMICITY DURING 1993 THROUGH 1996

During 1993 through 1996, three significant earthquakes occurred in the vicinity of Leroy Anderson Dam (Figure 8). These are the largest earthquakes in the Southern San Francisco Bay Area since the 1989 Loma Prieta earthquake and associated aftershocks. Significant earthquakes are defined as those with local magnitudes of about 5 or greater within about 50 miles of District dams. The three significant earthquakes include a magnitude 5.3 event approximately 14 miles southeast of the dam on January 16, 1993; a magnitude 4.7 event about 20 miles south of the dam on April 19, 1996; and a magnitude 4.9 event about 14 miles northwest of the dam on May 21, 1996. The crest monument surveys from 1993 through 1996 show that these earthquakes did not have substantial impact on monument positions (Figures 4, 5, and 6).

CHANGES IN SURVEILLANCE PROGRAM, DAM AND APPURTENANT STRUCTURES, AND OPERATIONS AND MAINTENANCE

Measurement of a part of the spillway underdrain flow began in May 1993. Overall, for the period 1993 through 1996, no significant modifications of the dam or appurtenant structures occurred, and no operational changes were made that would impact the surveillance data or its interpretation.

CONCLUSIONS

The surveillance data from Leroy Anderson Dam indicate acceptable performance of the dam and spillway for the period of this report. A comprehensive review of all historic surveillance data is planned. The spillway underdrain flows will also be evaluated for operational impacts. Surveillance will continue on the schedule indicated herein.

Sincerely,

ORIGINAL SIGNED BY

Robert E. Tepel
Engineering Geologist
Project Development

Attachments:
1. Table 1—Pertinent Dam Statistics (As-Built Modifications, 1988)
2. Table 2—1993 to 1996 Piezometer and Monthly Rainfall Data
3. Table 3—1993 to 1996 Monument Survey Data
4. Table 4—1993 to 1996 Spillway Underdrain Flow Data
5. Figure 1—Sketch Plan
6. Figure 2—Cross Section
7. Figure 3—Reservoir Water Level, Piezometric Surfaces, and Monthly Rainfall, January 1993 Through December 1996
8. Figure 4—Monument Z Direction (Vertical) Displacement Versus Time, July 1988 to May 1996
9. Figure 5—Monument X Direction Displacement Versus Time, July 1988 to May 1996
10. Figure 6—Monument Y Direction Displacement Versus Time, July 1988 to May 1996
11. Figure 7—Reservoir Level, Spillway Underdrain Flow, and Monthly Rainfall, May 1993 to December 1996
12. Figure 8—Regional Fault Map, Showing Significant Earthquakes Within 50 Miles of Leroy Anderson Dam, 1993 Through 1996

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TABLE 1

Pertinent Dam Statistics (As-built modifications, 1988)

Leroy Anderson Dam

DSOD No.	Year Completed	Type	Dam Height ft	Dam Crest Length ft	Storage Capacity (acre-ft)	Dam Crest Elev. ft	Spillway Crest Elev. ft	Total Freeboard ft
72-9	1950	Rolled Earth & Rock Fill	240	1,385	89,073	643.5	625.0	18.5

Note: basis of elevations is NGVD 1929

TABLE 2
1993 to 1996 Piezometer and Monthly Rainfall Data
Leroy Anderson Dam

Date	Reservoir Level (ft)	PPA-1	PPA-2	Monthly* Rainfall (in)
		Piezometric Surface Elevation (ft)		
01/20/93	546.52	549.47	470.81	9.48
02/17/93	589.48	550.16	471.27	6.59
03/17/93	617.05	550.63	474.73	2.36
04/20/93	623.58	551.09	AH	0.47
05/19/93	620.55	552.24	478.20	0.67
06/16/93	618.50	552.71	479.81	0.64
07/14/93	617.56	551.09	482.82	0.00
08/18/93	614.85	555.25	483.51	0.00
09/16/93	609.55	556.17	AH	0.00
10/28/93	603.25	561.25	488.36	0.43
11/18/93	603.02	559.87	AH	1.70
12/20/93	602.72	560.33	490.90	1.50
1/18/94	601.75	564.26	489.98	1.88
02/17/94	602.18	565.18	491.13	4.35
03/23/94	603.48	565.87	491.60	0.55
04/26/94	599.85	566.57	491.83	0.91
05/17/94	595.62	566.57	491.83	1.54
06/22/94	589.02	567.03	492.06	0.00
07/20/94	586.82	564.72	489.52	0.00
08/16/94	584.22	565.87	491.60	0.00
09/19/94	580.68	564.95	489.05	0.00
10/12/94	578.52	566.33	489.75	0.39
11/16/94	571.98	564.95	489.05	2.02
12/15/94	571.05	564.95	488.13	1.50
01/17/95	583.02	563.10	487.21	11.11
02/15/95	606.28	562.64	489.05	0.59
03/15/95	621.42	562.18	489.29	9.09
04/18/95	624.28	565.64	492.52	1.44
05/17/95	624.43	565.41	494.37	0.56
06/14/95	624.29	572.11	496.22	0.48
07/17/95	622.28	574.19	495.52	0.00
08/15/95	619.31	576.04	498.76	0.00
09/19/95	614.78	576.96	498.99	0.00
10/17/95	608.98	576.73	497.83	0.12
11/15/95	604.66	AH	496.22	0.00
12/18/95	604.68	574.88	497.14	6.34
01/19/96	603.21	571.19	495.98	3.34
02/16/96	615.64	572.11	495.29	7.57
03/18/96	624.64	572.57	497.37	2.44

TABLE 2
1993 to 1996 Piezometer and Monthly Rainfall Data
Leroy Anderson Dam

Date	Reservoir Level (ft)	PPA-1	PPA-2	Monthly* Rainfall (in)
		Piezometric Surface Elevation (ft)		
04/15/96	624.31	575.34	497.60	0.94
05/20/96	623.13	576.50	498.29	1.69
06/17/96	618.37	575.57	498.76	0.00
07/15/96	613.55	577.65	500.14	0.00
8/19/96	607.83	579.96	499.91	0.00
9/12/96	605.22	576.96	499.45	0.00
10/17/96	599.42	575.81	499.68	1.46
11/19/96	599.26	573.73	497.60	2.39
12/06/96	597.77	573.50	496.22	7.28

Notes:
1) basis of elevations is NGVD 1929
2) * = total rainfall at end of indicated month in Date column
3) AH = anomalously high reading

TABLE 3
1993 to 1996 Monument Survey Data
Leroy Anderson Dam

Date	Monument Z Direction (Vertical) Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	0.01	-0.03	-0.03	-0.01	-0.09	-0.11	-0.27	-0.21	-0.32	-0.26	-0.23	-0.35	-0.18	-0.16	-0.09	-0.05	-0.04	-0.04	-0.06
1/11/94	-0.02	-0.01	-0.01	0.01	-0.08	-0.07	-0.24	-0.18	-0.29	-0.25	-0.22	-0.35	-0.20	-0.16	-0.11	-0.06	-0.04	-0.03	-0.05
12/05/94	NR	NR	NR	0.02	-0.06	-0.06	-0.23	-0.17	-0.29	-0.24	-0.18	-0.30	-0.14	-0.13	-0.06	-0.02	0.00	0.02	NR
1/4/96	NR	NR	NR	-0.05	-0.12	-0.11	-0.25	-0.18	-0.30	-0.25	-0.19	-0.31	-0.14	-0.13	-0.07	-0.04	-0.03	-0.02	-0.01
5/22/96*	NR	NR	NR	0.01	-0.06	-0.04	-0.20	-0.15	-0.27	-0.24	-0.18	-0.30	-0.13	-0.12	-0.05	-0.01	-0.01	0.01	-0.01
1/29/97				.01	-.06	-.04	-.20	-.15	-.27	-.24	-.18	-.30	-.13	-.12	-.05	-.01	-.01	.01	-.01

Date	Monument X Direction Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	-0.10	-0.03	-0.03	-0.09	-0.12	-0.04	-0.12	-0.03	-0.09	-0.02	-0.07	-0.12	-0.01	-0.06	-0.02	-0.06	-0.05	-0.06	-0.06
1/11/94	-0.07	-0.06	-0.04	-0.09	-0.13	-0.07	-0.18	-0.09	-0.17	-0.08	-0.12	-0.17	-0.04	-0.09	-0.03	-0.06	-0.04	-0.06	-0.05
12/05/94	-0.05	-0.03	-0.03	-0.09	-0.13	-0.06	-0.17	-0.08	-0.16	-0.07	-0.12	-0.18	-0.04	-0.09	-0.03	-0.07	-0.05	-0.06	-0.06
1/4/96	-0.03	0.01	0.00	-0.09	-0.14	-0.09	-0.22	-0.13	-0.21	-0.12	-0.15	-0.23	-0.06	-0.12	-0.03	-0.08	-0.06	-0.08	-0.07
5/22/96*	NR	NR	NR	-0.10	-0.13	-0.10	-0.24	-0.15	-0.23	-0.12	-0.19	-0.25	-0.09	-0.15	-0.05	-0.10	-0.08	-0.09	-0.07
1/29/97				-.09	-.11	-.08	-.22	-.13	-.21	-.11	-.18	-.24	-.08	-.14	-.05	-.09	-.07	-0.08	-.07

Date	Monument Y Direction Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	-0.07	-0.07	-0.06	-0.06	-0.07	-0.10	-0.06	-0.10	-0.05	-0.05	-0.01	0.00	-0.02	-0.01	-0.03	-0.03	-0.05	-0.04	-0.06
1/11/94	-0.08	-0.05	-0.04	-0.06	-0.07	-0.10	-0.06	-0.09	-0.02	-0.04	0.00	0.01	0.01	-0.01	-0.01	-0.04	-0.03	-0.03	-0.05
12/05/94	-0.09	-0.07	-0.07	-0.06	-0.07	-0.10	-0.06	-0.10	-0.05	-0.06	0.00	0.01	-0.01	-0.01	-0.01	-0.04	-0.04	-0.04	-0.05
1/4/96	-0.07	-0.09	-0.04	-0.06	-0.08	-0.11	-0.06	-0.11	-0.04	-0.06	0.00	0.02	0.00	-0.01	-0.02	-0.04	-0.06	-0.05	-0.06
5/22/96*	NR	NR	NR	-0.05	-0.04	-0.06	-0.02	-0.05	0.01	-0.01	0.02	0.02	-0.01	-0.03	-0.04	-0.06	-0.06	-0.06	-0.07
1/29/97				-.06	-.03	-.05	-.01	-.04	.02	.0	.03	.03	-0	-.02	-.03	-.05	-.05	-.05	-.06

Notes:

1) Negative vertical displacement signifies settlement
2) Positive vertical displacement signifies heave
3) Y direction displacement signifies longitudinal movement
4) Negative X direction displacement signifies downstream movement
5) Positive X direction displacement signifies upstream movement
6) NR = monument survey data not recorded
7) Displacement is net movement since 1988
8) * = special monument survey after May 21, 1996 earthquake

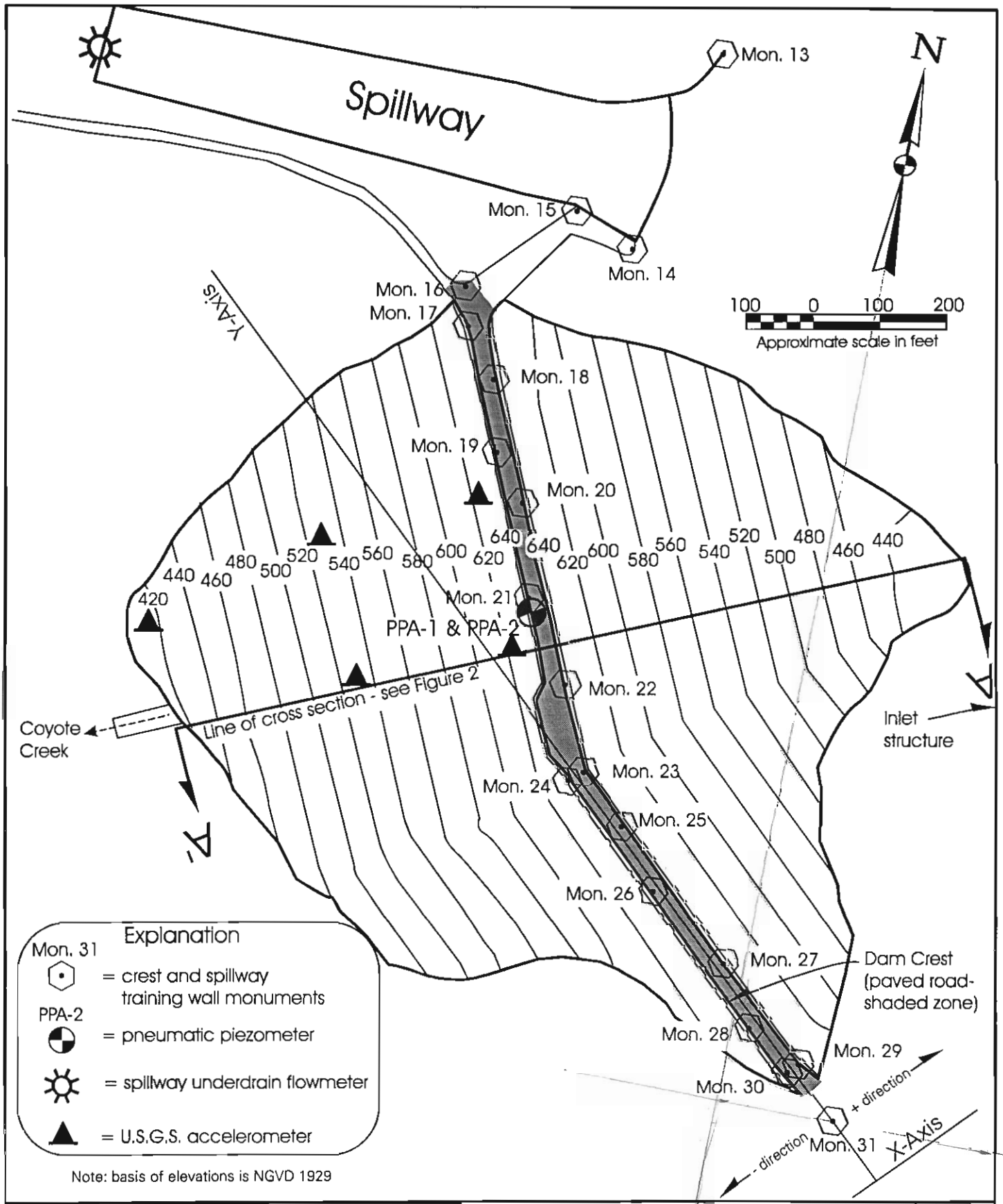
TABLE 4
1993 to 1996 Spillway Underdrain Flow Data
Leroy Anderson Dam

Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)
05/21/93	620.42	87	06/29/93	618.15	122	10/01/93	607.02	82
05/22/93	620.32	126	06/30/93	618.15	121	10/04/93	606.48	80
05/23/93	620.22	120	07/01/93	618.12	122	10/08/93	605.88	79
05/24/93	620.15	131	07/02/93	618.08	122	10/11/93	605.48	78
05/25/93	620.12	125	07/03/93	618.02	121	10/14/93	605.12	76
05/26/93	620.02	124	07/04/93	617.98	121	10/18/93	604.75	76
05/27/93	619.95	124	07/05/93	617.95	121	10/21/93	604.32	75
05/28/93	619.85	123	07/06/93	617.92	121	10/25/93	603.62	74
05/29/93	619.78	124	07/07/93	617.88	121	10/28/93	603.25	72
05/30/93	619.72	123	07/08/93	617.85	121	02/22/94	602.68	66
05/31/93	619.62	124	07/09/93	617.82	121	02/24/94	602.68	43
06/01/93	619.55	123	07/11/93	617.72	121	02/28/94	604.18	60
06/02/93	619.45	123	07/12/93	617.68	121	03/03/94	604.68	63
06/03/93	619.35	123	07/13/93	617.65	121	03/07/94	604.05	65
06/04/93	619.28	124	07/14/93	617.58	121	03/10/94	603.58	64
06/05/93	619.22	124	07/15/93	617.55	121	03/17/94	603.52	63
06/06/93	619.15	124	07/16/93	617.52	121	03/21/94	603.52	62
06/07/93	619.12	123	07/19/93	617.42	120	03/24/94	603.48	63
06/08/93	619.05	124	07/22/93	617.28	120	03/28/94	603.55	63
06/09/93	618.98	113	07/27/93	617.15	120	03/31/94	603.52	61
06/10/93	618.92	126	07/29/93	617.08	120	04/04/94	603.52	61
06/11/93	618.85	122	08/02/93	616.95	120	04/07/94	603.22	61
06/12/93	618.78	122	08/06/93	616.72	120	04/11/94	602.58	59
06/13/93	618.72	103	08/09/93	616.28	120	04/14/94	602.08	60
06/14/93	618.65	125	08/12/93	615.82	118	04/18/94	601.38	53
06/15/93	618.58	122	08/16/93	615.15	116	04/21/94	600.75	39
06/16/93	618.55	122	08/19/93	614.68	114	04/25/94	599.95	37
06/18/93	618.42	122	08/23/93	614.05	112	04/28/94	599.55	34
06/19/93	618.42	121	08/27/93	613.32	109	05/02/94	598.82	32
06/20/93	618.38	121	08/30/93	612.65	107	05/05/94	598.32	35
06/21/93	618.35	123	09/02/93	612.05	104	05/09/94	597.65	31
06/22/93	618.32	121	09/07/93	611.18	100	05/12/94	596.95	26
06/23/93	618.32	121	09/09/93	610.82	94	05/16/94	595.88	24
06/24/93	618.28	122	09/13/93	610.05	91	05/19/94	595.28	28
06/25/93	618.28	122	09/16/93	609.55	88	05/23/94	594.45	24
06/26/93	618.28	123	09/20/93	609.02	87	05/26/94	593.65	21
06/27/93	618.25	121	09/23/93	608.45	86	05/31/94	592.05	17
06/28/93	618.22	122	09/27/93	607.72	84	06/02/94	591.52	3

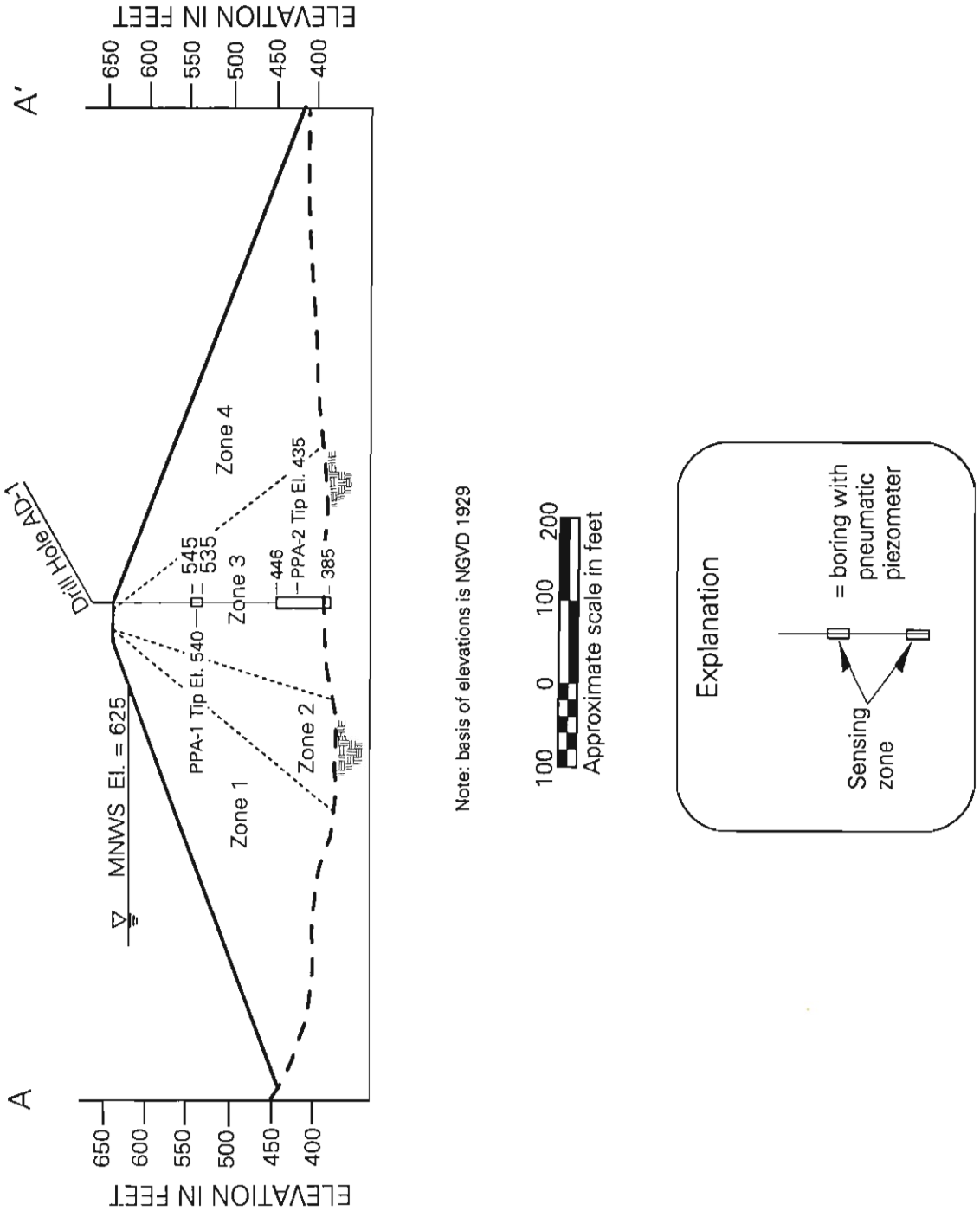
TABLE 4
1993 to 1996 Spillway Underdrain Flow Data
Leroy Anderson Dam

Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)
06/06/94	591.02	2	09/05/95	616.78	116	06/17/96	618.37	143
06/09/94	590.65	0	09/07/95	616.62	116	06/20/96	617.90	142
06/16/94	589.78	0	09/18/95	614.95	114	06/25/96	617.06	139
06/23/94	588.92	0	09/25/95	613.72	104	06/27/96	616.74	137
03/02/95	606.42	37	09/28/95	613.28	102	07/01/96	616.08	121
03/06/95	606.48	38	10/02/95	612.78	101	07/11/96	614.28	110
03/09/95	606.55	39	10/12/95	610.23	95	07/15/96	613.55	125
03/11/95	612.78	52	10/16/95	609.20	87	07/19/96	612.87	121
05/11/95	624.02	109	10/19/95	608.62	85	07/22/96	612.29	121
05/15/95	624.22	114	10/26/95	607.29	81	07/25/96	611.67	119
05/18/95	624.38	115	10/30/95	606.54	78	07/29/96	610.87	116
05/22/95	624.52	117	11/02/95	606.04	75	08/01/96	610.21	113
05/25/95	624.58	119	11/09/95	604.73	72	08/05/96	609.78	110
05/30/95	624.72	121	11/13/95	604.67	67	08/12/96	608.72	106
06/05/95	624.52	123	11/16/95	604.66	66	08/16/96	608.20	101
06/08/95	624.38	127	11/20/95	604.42	65	08/19/96	607.83	98
06/12/95	624.15	127	11/27/95	604.35	64	08/22/96	607.49	96
06/15/95	624.25	129	12/07/95	606.30	64	08/26/96	607.06	94
06/19/95	623.95	130	12/11/95	604.24	64	08/29/96	606.76	90
06/26/95	623.65	130	12/18/95	604.68	71	09/05/96	606.01	88
06/29/95	623.45	131	12/21/95	603.85	67	09/12/96	605.22	83
07/03/95	623.22	104	12/26/95	603.15	65	09/16/96	604.76	79
07/06/95	623.02	85	12/28/95	603.16	55	09/30/96	603.46	73
07/10/95	622.72	128	01/04/96	603.26	61	10/03/96	602.96	69
07/13/95	622.52	128	01/08/96	603.17	59	10/07/96	601.83	66
07/17/95	622.28	128	01/11/96	603.15	58	10/10/96	601.07	61
07/20/95	622.08	128	01/18/96	603.17	59	10/17/96	599.42	56
07/24/95	621.75	128	01/25/96	603.62	61	10/22/96	598.42	49
07/27/95	621.58	128	02/05/96	611.72	72	10/24/96	598.50	46
07/31/95	621.28	128	05/13/96	623.82	157	10/28/96	598.75	46
08/03/95	621.02	127	5/16/96	623.59	158	11/01/96	599.01	48
08/07/95	620.45	126	5/21/96	623.06	158	11/07/96	599.30	45
08/10/95	620.02	125	5/23/96	622.83	155	11/14/96	599.49	46
08/14/95	619.48	124	5/28/96	622.14	155	11/18/96	599.36	48
08/17/95	619.05	122	06/04/96	620.36	151	11/25/96	598.85	48
08/24/95	618.15	121	06/06/96	619.93	146	12/05/96	597.84	43
08/28/95	617.62	119	06/10/96	619.34	146	12/09/96	597.70	41
08/31/95	617.28	119	06/13/96	618.90	145	12/12/96	598.49	46

Note: Basis of elevations is NGVD 1929



DATE 9/24/96	Santa Clara Valley Water District	Sketch Plan Leroy Anderson Dam (No. 72-9) Surveillance Instrumentation	SCALE 1" = 200'
DESIGN JLN			FIGURE 1
DRAWN JLN			
CHECKED RET			



DATE 9/24/96	Santa Clara Valley Water District	Cross Section	SCALE 1" = 200'
DESIGN JLN		Leroy Anderson Dam (No. 72-9)	FIGURE
DRAWN JLN		Piezometer Locations	2
CHECKED RET			

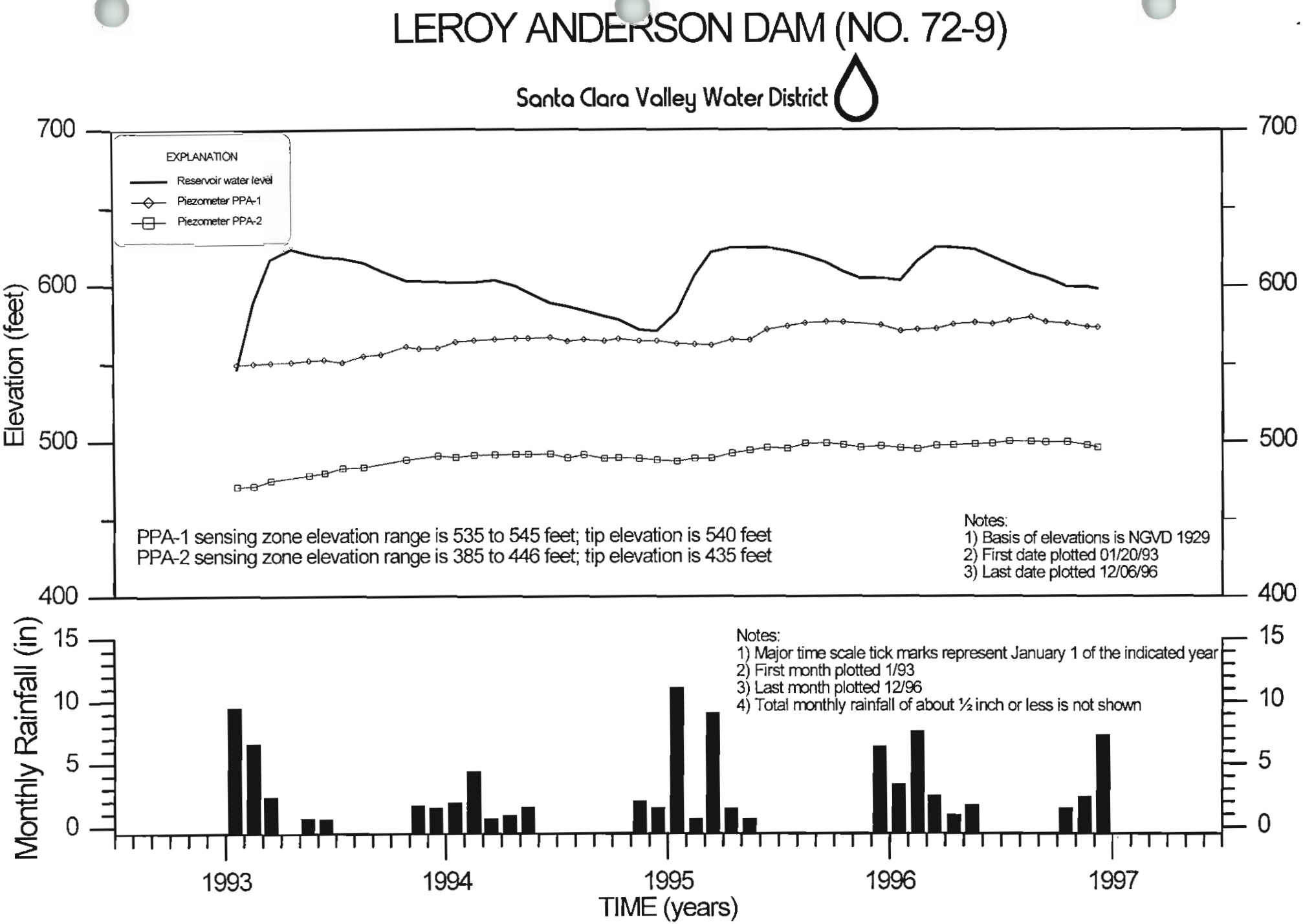


Figure 3. Reservoir Water Level, Piezometric Surfaces, and Monthly Rainfall, January 1993 through December 1996

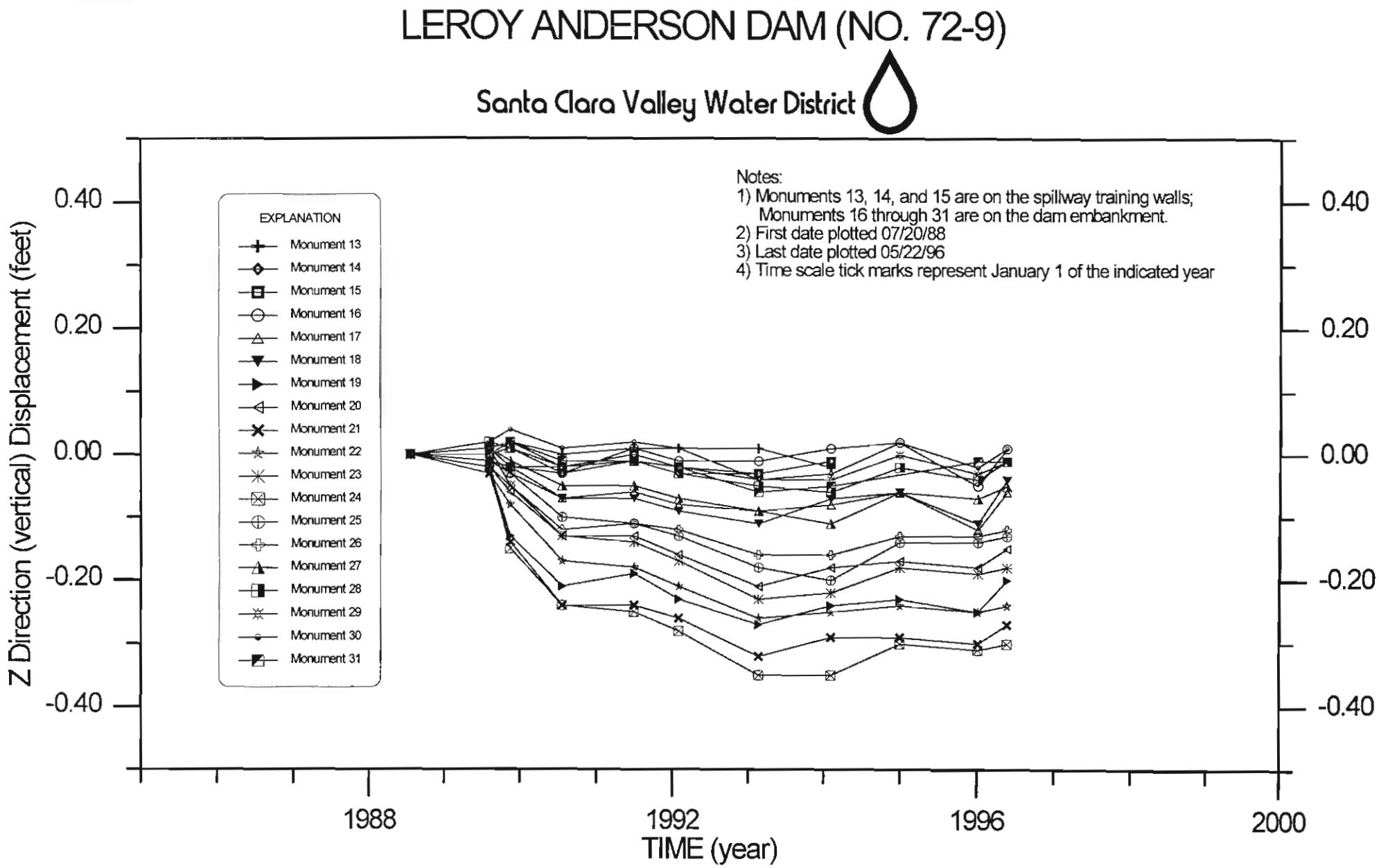


Figure 4. Monument Z Direction (Vertical) Displacement Versus Time, July 1988 to May 1996

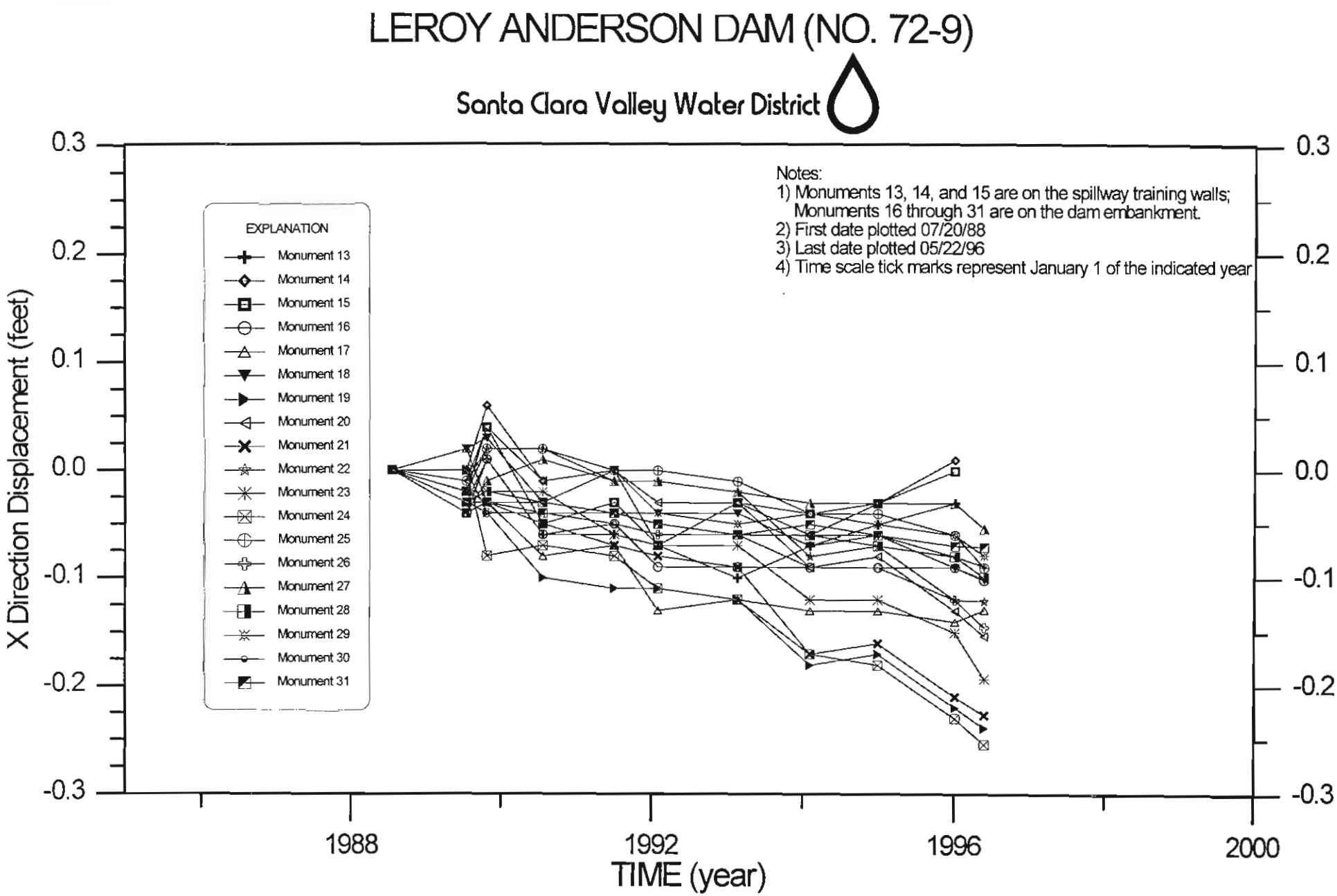


Figure 5. Monument X Direction Displacement Versus Time, July 1988 to May 1996

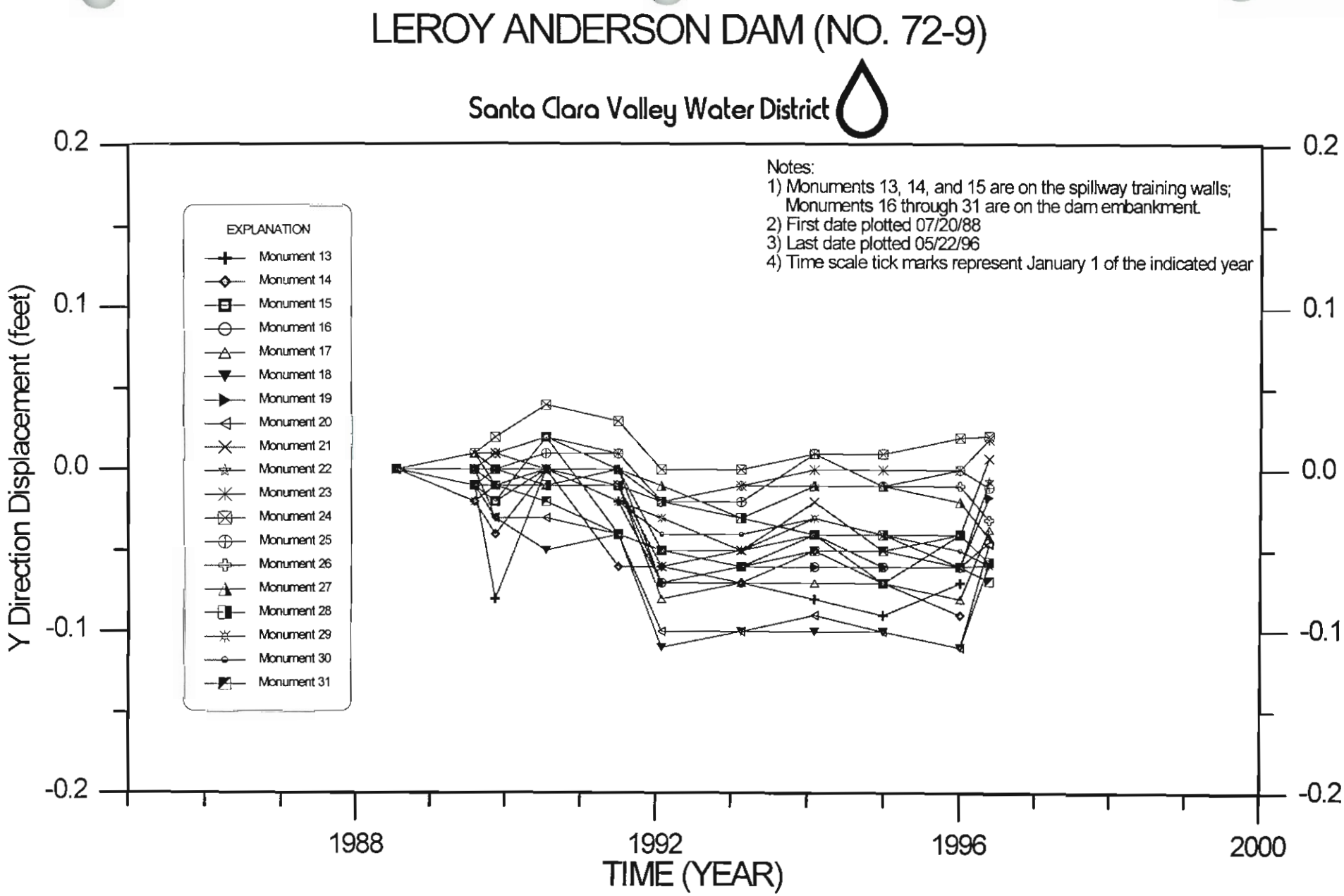
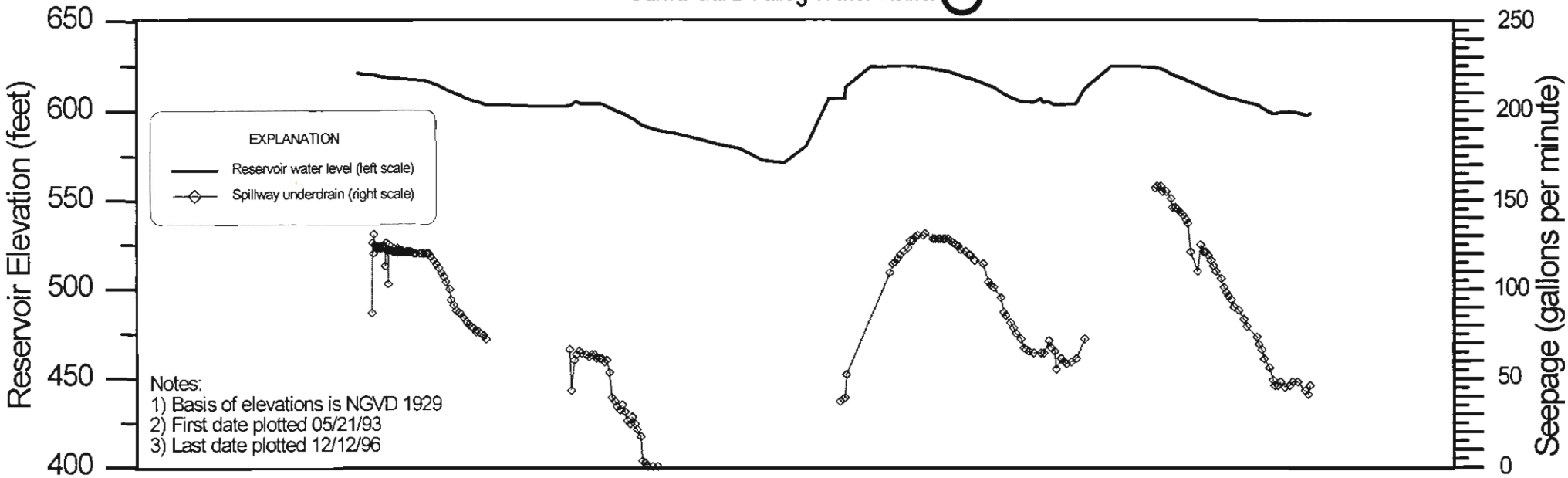


Figure 6. Monument Y Direction Displacement Versus Time, July 1988 to May 1996

LEROY ANDERSON DAM (NO. 72-9)

Santa Clara Valley Water District



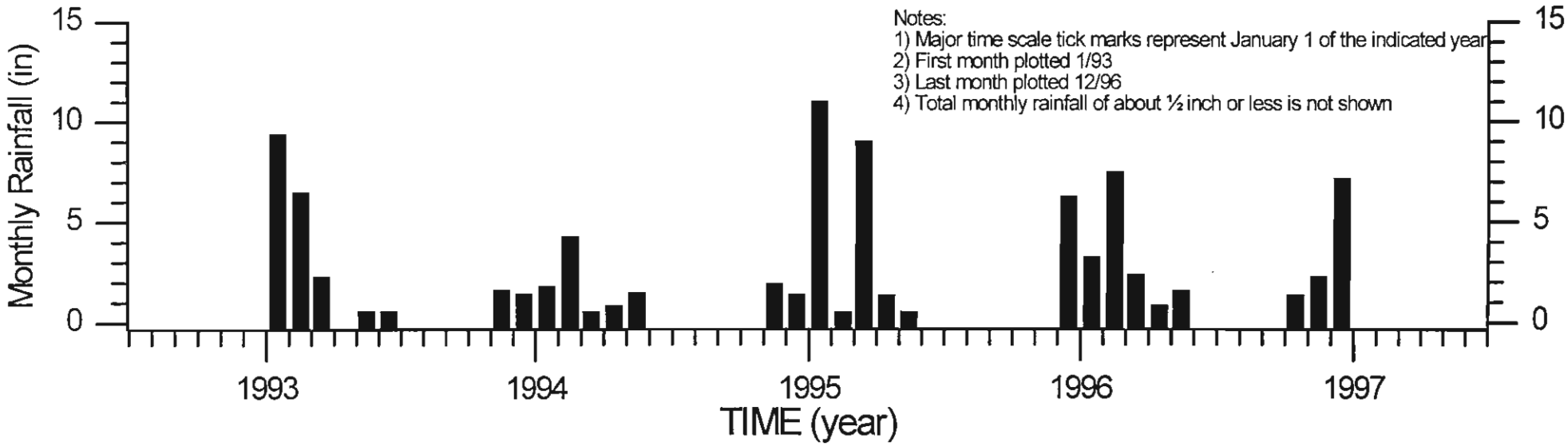


Figure 7. Reservoir Level, Spillway Underdrain Flow, and Monthly Rainfall, May 1993 to December 1996

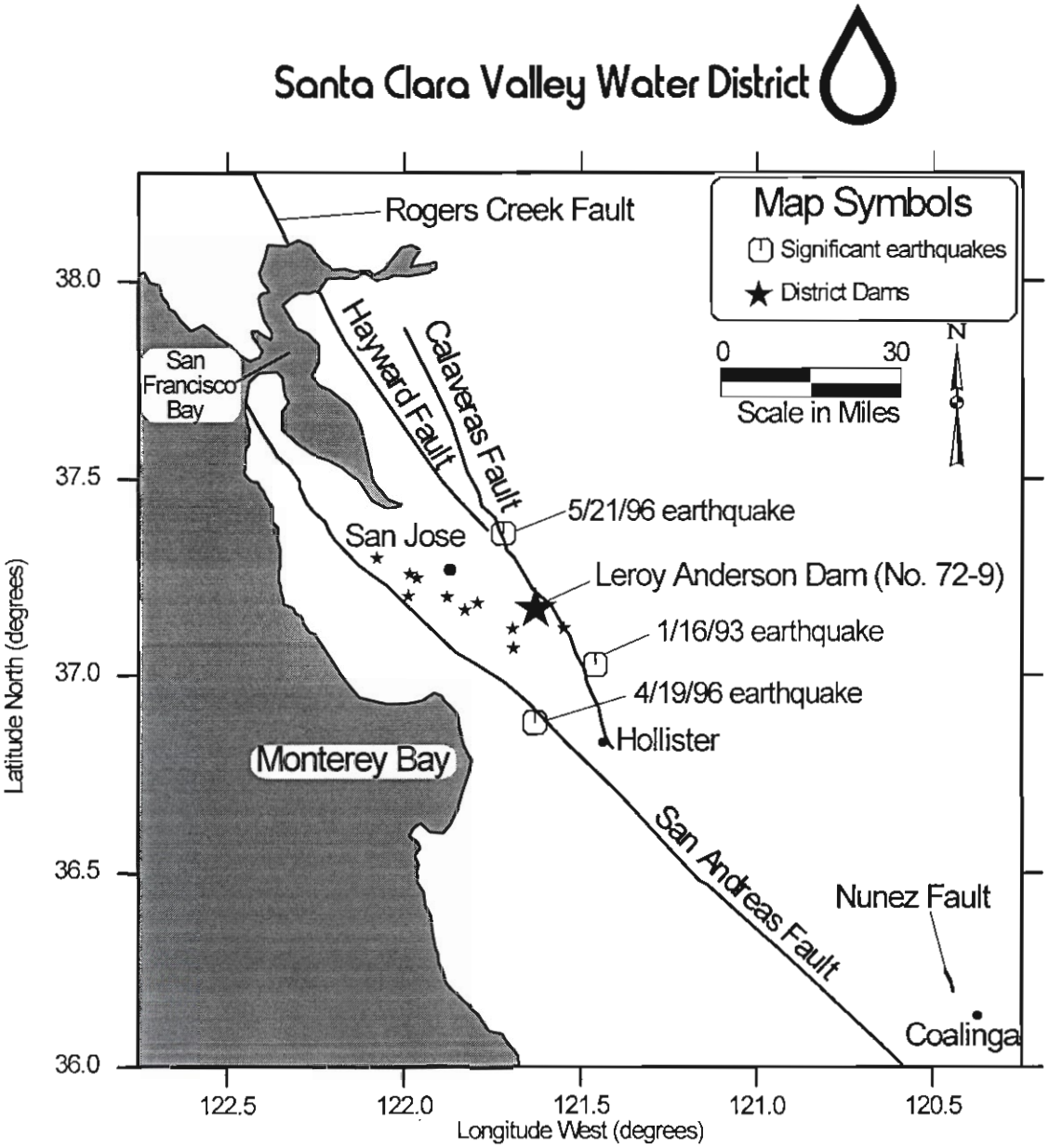


Figure 8. Regional Fault Map, Showing Significant Earthquakes within 50 Miles of Leroy Anderson Dam, 1993 through 1996